

**WE CLAIM:**

1. An automatic gain control (AGC) circuit, comprising:  
an input adapted to receive a signal;  
a compression circuit coupled to the input having a compression ratio, the  
5 compression ratio being applied to the signal exceeding a first predetermined  
threshold, the compression ratio being applied as a function of a predetermined  
signal peak level.
2. The automatic gain control circuit as specified in Claim 1 wherein said  
10 circuit further comprises a gain applied to the signal, which gain is not uniformly  
distributed to the signal.
3. The automatic gain control circuit as specified in Claim 2 wherein the gain  
comprises a canonical signed digit (CSD) multiplier.  
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4. The automatic gain control circuit as specified in Claim 3 wherein a  
maximum gain step of the gain is between 0.25 and 0.5dB.
5. The automatic gain control circuit as specified in Claim 2 wherein an  
20 instantaneous gain value is produced by evaluating the compression ratio.
6. The automatic gain control circuit as specified in Claim 3 wherein the  
CSD multiplier adjusts the gain in real time.
- 25 7. The automatic gain control circuit as specified in Claim 3 further  
comprising a look-up table storing discrete sound pressure level (SPL) values and  
a second table storing information indicative of gain values.

8. The automatic gain control circuit as specified in Claim 7 further comprising a state machine tracking a peak level of the signal such that positions of an upper and lower SPL value is determined in one table.
- 5 9. The automatic gain control circuit as specified in Claim 8 wherein the gain value in the second table is a function of the state machine tracking.
10. The automatic gain control circuit as specified in Claim 7 wherein the second table stores CSD codes rather than actual gain values.
- 10 11. The automatic gain control circuit as specified in Claim 10 further comprising a table storing only a fraction of actual gain values.
12. The automatic gain control circuit as specified in Claim 11 wherein  
15 remaining actual gain values are determined by a scale factor.
13. The automatic gain control circuit as specified in Claim 12 wherein the scale factor is a  $2^S$  scale factor.
- 20 14. The automatic gain control circuit as specified in Claim 12 wherein the scale factor is a simple shift.
15. The automatic gain control circuit as specified in Claim 1 wherein the compression circuit comprises a state machine having a first and second  
25 comparator and a first and second register, the first comparator comparing the input signal to the content of the first register and the second comparator comparing the input signal to the content of the second register.

16. The automatic gain control circuit as specified in Claim 15 wherein the content of the first register is moved to the second register when the input signal exceeds the first predetermined threshold.

5 17. The automatic gain control circuit as specified in Claim 16 further comprising a third and fourth register, wherein the content of the third register is also responsively moved to the fourth register and the content of the third register is decreased by 1.

10 18. The automatic gain control circuit as specified in Claim 2 wherein the gain has hysteresis.

19. The automatic gain control circuit as specified in Claim 7 wherein the SPL values are uniformly distributed.

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20. The automatic gain control circuit as specified in Claim 7 wherein the SPL values are not uniformly distributed.

21. The automatic gain control circuit as specified in Claim 11 wherein the  
20 gain values are divided into blocks of numbers, the blocks being scaled with respect to each other.

22. The automatic gain control circuit as specified in Claim 21 wherein the scaling of blocks is by a power-of-two.

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23. A method of providing automatic gain control (AGC) to an input signal, comprising the steps of:

providing a compression ratio to the input signal when the input signal exceeds a first predetermined threshold.

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24. The method as specified in Claim 23 further comprising the step of applying a gain to the input signal, wherein the gain is not uniformly distributed to the signal.

10 25. The method as specified in Claim 24 wherein the gain is applied by a canonical signed digit (CSD) multiplier.

26. The method as specified in Claim 25 wherein the gain is applied after evaluating the compression ratio.

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27. The method as specified in Claim 25 wherein the CSD multiplier adjusts the gain in real time.

28. The method as specified in Claim 24 further comprising a look-up table  
20 storing discrete sound pressure level (SPL) values and a second table storing information indicative of gain values.

29. The method as specified in Claim 28 further comprising a state machine tracking a peak level of the signal such that positions of an upper and lower SPL  
25 value is determined in one table.

30. The method as specified in Claim 29 wherein the gain value in the second table is a function of the state machine tracking.

31. The method as specified in Claim 25 wherein the second table stores CSD  
5 codes rather than actual gain values.

32. The method as specified in Claim 31 further comprising a table storing  
only a fraction of actual gain values.

10 33. The method as specified in Claim 32 wherein remaining actual gain values  
are determined by a scale factor.